CLAIMS

1. Method for increasing process stability, especially absolute gage precision and plant safety, in the hot rolling of steel or nonferrous materials with small degrees of deformation (φ) or small reductions, taking into account the yield point at elevated temperature (R_e) when calculating the set rolling force (F_W) and the given adjustment position (s), characterized by the fact that the following relation is used to determine the yield point at elevated temperature (R_e) as a function of the deformation temperature (T) and/or deformation rate (φp), which is then integrated in the function of the flow stress ($k_{f,R}$) for determining the set rolling force (F_W)

$$R_e = a + e^{b1+b2 \cdot T} \cdot \exists p^c$$

(2)

where

R_e	= yield point at elevated temperature
T	= deformation temperature
$\exists p$	= deformation rate
$a,; b; c$	= coefficients

2. Method in accordance with Claim 1, characterized by the fact that a multiplicative flow curve relation is expanded by the yield point at elevated temperature (R_e) as a function of the deformation temperature (T) and deformation rate ($\sqsupset p$) according to the formula

$$k_{f,R} = a + e^{b1 \cdot b2 \cdot T} \cdot \sqsupset p^{c} \cdot k_{f0} \cdot A_1 \cdot e^{m1 \cdot T} \cdot A_2 \cdot \sqsupset^{m2} \cdot A_3 \cdot \sqsupset p^{m3}$$

(3)

3. Method in accordance with Claim 1 and Claim 2, characterized by the fact that the flow stress ($k_{f,R}$) is integrated in the conventional rolling force equation for determining the set rolling force (F_W) for the automatic gage control as well as for computational models and automatic control processes according to the following equation

$$F_W = Q_p \cdot k_{f,R} \cdot B \cdot (R_W \cdot (h_0 - h_1))^{1/2}$$

(4)

where

F_W = set rolling force

Q_p = function for taking into account the roll gap geometry and friction conditions

$k_{f,R}$ = flow stress, taking into account the yield point

B = rolling stock width

R_w = roll radius

h_0 = thickness before the pass

h_1 = thickness after the pass

4. Method in accordance with any of Claims 1 to 3, characterized by the fact that a material modulus (C_M) is calculated on the basis of the set rolling force (F_W), taking into account the yield point at elevated temperature (R_e) as a function of the deformation temperature (T) and deformation rate (□p) for degrees of deformation smaller than a material-specific limiting degree of deformation (φ_G), according to the formula

$$C_M = (F_W - F_m)/dh_1$$

(5)

where

C_M = material modulus

F_W = set rolling force

F_m = measured rolling force

dh_1 = change in the runout thickness

5. Method in accordance with Claim 4, characterized by the fact that the conventional gage meter equation is expanded into the form

$$ds_{AGC} = (1 + C_M/C_G)\,dh_1 = (1 + C_M/C_G)\cdot((F_W - F_m)/C_G + s - s_{soll})$$

(6)

where

ds_{AGC} = change in the roll gap setting

C_M = material modulus

C_G = rolling stand modulus

dh_1 = change in the runout thickness

F_W = set rolling force

F_m = measured rolling force

s = adjustment of the roll gap

s_{soll} = desired adjustment of the roll gap

Figure 1.

KEY:

Stand der Technik = Prior Art

Fließspannung k_f = flow stress k_f

Umformgrad ⊐ = degree of deformation ⊐

Figure 2.

KEY:

Stand der Technik = Prior Art

Fließspannung k_f = flow stress k_f

Umformgrad ⊐ = degree of deformation ⊐

(T, phip) = (*T*, ⊐*p*)